CLAIMS:

1. A process for preparation of an immunogenic peptide mixture comprising the steps of:

obtaining immunogenic eptitope sequences of a pathogen, said immunogenic epitope sequences having a common residue region and at least one variable residue with which said sequences differ from each other;

determining the frequency with which different amino acids are found at a variable residue of the immunogenic epitope sequences;

synthesizing a peptide mixture comprising up to about 100 different peptides, each peptide having the common residue region and having at a variable residue position an amino acid selected from those found at the variable residue of the immunogenic epitope sequences with a frequency greater than a threshold frequency of from about 10% to about 30%.

2. The process of claim 1 wherein the threshold frequency is about 12%.

3. The process of claim 1 wherein the peptide mixture comprises sequences having at the variable residue an amino acid selected from the amino acids most frequently found as the variable residue in the immunogenic epitope sequences, provided that no more than 4 different amino acids appear at the variable residue position of different peptides within the peptide mixture.

4. The process of claim 3 wherein during the step of synthesizing the peptide mixture, peptides are formed so that the different amino acids appearing at the variable residue position are present relative to each other in proportion to the frequency with which each different amino acid appears at the variable residue of the immunogenic epitope sequences.

5. The process of claim 1 wherein the frequency with which an amino acid is found at a variable residue is rounded to the nearest 25%, and only those amino acids having a

non-zero rounded frequency are included at the variable residue position in the peptides of the peptide mixture.

6. The process of claim 5 wherein the peptides of the peptide mixture have a given amino acid present at the variable residue position with a frequency proportional to the rounded frequency of said given amino acid.

7. The process of claim 6 wherein the frequencies of similar amino acids found at a variable residue are pooled, and the pooled frequency is assigned to the most frequently found of the similar amino acids when calculating the rounded frequency.

8. The process of claim 7 wherein the frequencies of similar amino acids found at a variable residue are pooled only if the similar amino acids individually have a frequency below the threshold frequency.

9. The process of claim 7 wherein the frequencies of similar amino acids are only pooled if, upon rounding each similar amino acid frequency to the nearest 25%, no similar amino acid has a rounded frequency of 25% or greater.

10. The process of claim 7 wherein similar amino acids are selected from those belonging to the group consisting of: aromatic amino acids; aliphatic amino acids; aliphatic hydroxyl side chain amino acids; basic amino acids; acidic amino acids; amide-containing amino acids, and sulphur-containing amino acids.

11. The process of claim 5 wherein the step of synthesis is conducted using amino acid coupling, and the variable residue position is coupled by adding amino acids in proportion to their rounded frequencies.

12. The process of claim 1 wherein said immunogenic epitope sequences comprise from 2 to 7 variable residues.

13. The process of claim 1 wherein the peptide mixture contains from 2 to about 64 different peptides.

14. The process of claim 1 wherein at least one step is conducted using a bioinformatics methodology.

15. A process for preparation of an immunogenic peptide mixture comprising the steps of:

obtaining immunogenic eptitope sequences of a pathogen, said immunogenic epitope sequences having a common residue region and at least one variable residue with which said sequences differ from each other;

determining the frequency with which different amino acids are found at a variable residue of the immunogenic epitope sequences;

rounding the frequency with which an amino acid is found at a variable residue to the nearest 25%;

synthesizing a peptide mixture comprising up to about 100 different peptides, each peptide having the common residue region and having at a variable residue position an amino acid selected from those most frequently found at a variable residue of the immunogenic epitope sequences, provided said amino acid has a non-zero rounded frequency;

said variable residue position being selected from two to four different amino acids, each of said two to four different amino acids being represented in said peptide mixture in proportion to its rounded frequency.

16. The process of claim 15, additionally comprising the steps of:

pooling the frequencies of similar amino having rounded frequencies less than 25%,

assigning the pooled frequency to the most frequently occurring of the similar amino acids;

rounding the pooled frequency to the nearest 25%; and,

for non-zero rounded frequencies, including the most frequently occurring of the similar amino acids in the step of synthesizing a peptide mixture.

17. A peptide mixture immunogenic to a pathogen, said mixture comprising up to about 100 different peptides, each peptide having a common residue region and having a variable residue position;

the common residue region of the different peptides being non-variable amino acids of an immunogenic epitope sequence of a pathogen, adjacent a variable residue of the immunogenic epitope sequence;

the variable residue position being occupied by an amino acid selected from the group consisting of the most frequently occurring amino acids at the variable residue of the immunogenic epitope sequence provided that:

(a) no more than four different amino acids are present at the variable residue position of the different peptides of the peptide mixture; and

(b) an amino acid present at the variable residue position of the different peptides appears at the variable residue of the immunogenic epitope sequence with a frequency greater than a threshold frequency of from about 10% to about 30%.

18. The peptide mixture of claim 17, wherein the frequency with which an amino acid appears at a variable residue position is determined according to the following scheme:

the frequency with which an amino acid occurs at the variable residue of the immunogenic epitope sequence is rounded to the nearest 25%, and

amino acids having non-zero rounded frequencies are found at the variable residue position of the different peptides with a frequency proportional to the rounded frequency.

19. The peptide mixture of claim 18, wherein the frequency with which similar amino acids having a rounded frequency less than 25% appear at a variable residue position is determined according to the following scheme:

the frequencies of similar amino acids are pooled and rounded to the nearest 25%;

for non-zero rounded frequencies, the rounded frequency is assigned to the most frequently occurring of the similar amino acids;

the most frequently occurring of the similar amino acids is found at the variable residue position of the different peptides with a frequency proportional to the rounded frequency.

20. A conjugated peptide composition comprising the peptide mixture of claim 17 conjugated to a lipid moiety.

21. A conjugated peptide composition comprising the peptide mixture of claim 17 conjugated to a carrier protein moiety.

22. An immunogenic composition comprising a plurality of peptide mixtures formed according to claim 17, wherein each of said peptide mixtures is immunogenic to the same pathogen.

23. The immunogenic composition according to claim 22, wherein each of said plurality of peptide mixtures is directed to a different immunogenic epitope sequence of the same pathogen, and the different immunogenic epitope sequences are found in regions in close proximity on the pathogen surface.

24. A vaccine for invoking an immunogenic response against a pathogen comprising the peptide mixture of claim 17 and a pharmaceutically acceptable carrier.

25. A method of vaccination against a pathogenic disease comprising the step of administering to a subject an effective amount of the vaccine of claim 24.

26. A method of diagnosing infection of a subject by a pathogen, the method comprising the steps of:

obtaining an antibody-containing biological sample from said subject;

contacting the biological sample with the immunogenic peptide mixture of claim 1 based on immunogenic epitope sequences of the pathogen; and

evaluating immunogenic response of said sample with said peptide mixture.

27. A diagnostic kit for determining infection of a subject by a pathogen comprising:

the immunogenic peptide mixture of claim 1 based on immunogenic epitope sequences of the pathogen, and

directions for evaluating an immunogenic response of an antibody-containing biological sample of the subject with the immunogenic peptide mixture.

28. A process for isolating an antibody immunogenic to a pathogen comprising the steps of:

administering to a subject the peptide mixture of claim 17; and

obtaining an antibody from the subject induced by administration of the peptide mixture.

29. A process for isolating a gene encoding an antibody immunogenic to a pathogen comprising the steps of:

administering to a subject the peptide mixture of claim 17;

obtaining an antibody from the subject induced by administration of the peptide mixture; and

isolating a gene encoding the antibody.

30. A process for isolating a portion of a gene or genetic material encoding genetic material encoding all or part of an antibody reactive with a pathogen comprising the steps of:

administering to a subject the peptide mixture of claim 17;

obtaining from the subject an antibody, or part of an antibody reactive with the pathogen, induced by administration of the peptide mixture; and

isolating said portion of a gene or genetic material encoding the antibody or the part of the antibody reactive with the pathogen.

31. An immunotherapy against a pathogen comprising administration of a peptide or protein encoded by a portion of the gene or genetic material obtained according to the process of claim 30 to a subject.